PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

2 JUN 2005

Applicant's or agent's file reference pol.2576.pct.df.e	**FOR FURTHER ACTION**	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/GB 03/05716	International filing date *(day/month/year)* 31.12.2003	Priority date *(day/month/year)* 02.01.2003
International Patent Classification (IPC) or both national classification and IPC G01N21/55		
Applicant PACIFIC SHELF 1258 LIMITED		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

I	☒	Basis of the opinion
II	☐	Priority
III	☐	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	☐	Lack of unity of invention
V	☒	Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	☐	Certain documents cited
VII	☐	Certain defects in the international application
VIII	☐	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
02.08.2004	11.04.2005
Name and mailing address of the international preliminary examining authority: European Patent Office - Gitschiner Str. 103 D-10958 Berlin Tel. +49 30 25901 - 0 Fax: +49 30 25901 - 840	Authorized Officer Navas Montero, E Telephone No. +49 30 25901-632

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB 03/05716

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-13 as originally filed

Claims, Numbers

1-20 received on 21.08.2004 with letter of 18.08.2004

Drawings, Sheets

1/3-3/3 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   (Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-20
	No:	Claims	
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-20
Industrial applicability (IA)	Yes:	Claims	1-20
	No:	Claims	

2. Citations and explanations

   see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:
D1: WO 92/05426 A (AMERSHAM INT PLC) 2 April 1992 (1992-04-02); and
D2: US 2001/040130 A1 (CULLEN DAVID C ET AL) 15 November 2001 (2001-11-15).

2 **Independent claims 1, 14, and 17** of the present application are not inventive within the meaning of **Article 33(3) PCT**.

2.1 As regards **claim 1** document D1 discloses a cartridge for use in a surface plasmon resonance sensor (cf. page 4, lines 19 to 22), the cartridge comprising an optical element (1) having a first surface (7) and a mounting member (10) for supporting a sensing agent (11) located on a second surface of the optical element, the first surface comprising a first means (7) for directing a beam of light (4) incident on the optical element towards the second surface at an angle of incidence to the second surface that results in substantially total internal reflection (cf. e.g. page 1, line 32 to page 2, line 2 and page 12, lines 27 to 36) of the beam of light at an interface of the mounting member and the second surface (17).

2.2 The contribution of **claim 1** over the prior art is that the cartridge further comprises a detachable channel suitable for containing a fluid sample to be tested. The objective problem solved by the difference is to enable the analysis of larger amounts of sample, eventually in flow-regime (cf. page 10, line 31 to 11, line 5 of the description). The detection of analytes present in trace amounts often requires the analysis of more sample to reach a minimun of sensitivity. Also is the continuous monitoring of flowing samples a well-known problem in the art. As a consequence, the identification of the objective problem stated above cannot *per se* be considered inventive. For solving the problem the skilled person would consider the teachings of D2. Document D2 discloses a surface plasmon resonance (SPR) sensor which comprises a glass prism (41) having one of its faces coated with a sensing surface (43) and a detachable channel (47). The skilled person would realize that said detachable channel is held against the prism so that the liquid sample can flow past the sensing

surface (cf. lines 3 to 5 of par. 88). The system of D2, furthermore, teaches the use of a prism which can be disposable (cf. lines 23 to 26 of par. 73 and lines 5 to 8 of par. 75) which is a bonus effect much in the line of the cartridge of D1. Being prism and channel held together simply by means of a first and a second clamps (45, 53) he would consider the implementation of such a detachable channel to the cartridge of D1 as a matter of routine, arriving at the subject-matter of **claim 1** without having to be inventive.

2.3 Other considerations such as the miniaturisation, the simplified alignment, or the capability of multiple testing, are not present as technical features and are therefore regarded as being of no-relevance for the assessment of the claim.

2.4 Additionally to the corresponding objection with respect to the cartridge, document D1 discloses in accordance with **claim 14**: a surface plasmon resonance sensor comprising a light source (32) for generating a beam of light (33), and a light beam detection means (29) wherein the employment of the cartridge allows for the miniaturisation of the sensor[1].

2.5 Contrary to applicant's opinion it is considered that both documents D1 (cf. fig. 9) and D2 (cf. par. 75) disclose devices well suited for the field detection. It is not apparent why the skilled person would not make use of them for that purpose. As regards **claim 17** e.g. document D1 discloses the selection of the appropriate cartridge for the detection of one or more pathogens and the use of it for the proper test (cf. page 1, lines 3 to 7). The standard calibration procedure pertains to the general background knowledge and is, therefore, disclosed by D1 to the skilled person.

3 **Dependent claims 2 to 13, 15, 16, and 18 to 20** are not inventive in the sense of **Article 33(3) PCT**.

3.1 Document D2 discloses the additional subject-matter of **claim 2** (cf. par. 88, lines 1 to 5).

3.2 Document D1 further discloses the additional subject-matter of **claims: 3 and 6** (cf.

[1]See in this respect the compact construction of fig. 9.

page 15, lines 20 to 24), **4 and 7** (cf. page 3, lines 12 to 15), **5** (cf. page 19, lines 33 and 34), **8** (cf. page 20, lines 27 to 30), **9 to 13[2], and 18** (cf. page 6, line 31 to page 7, line 3), **15** (cf. page 9, lines 35 and 36), and **16** (cf. page 16, lines 28 to 30).

3.3 The additional subject-matter of **claims 19 and 20** represents the standard calibration as well as measurement procedures.

[2] Additional subject-matter disclosed for the skilled person.

Claims

1) A cartridge for use in a Surface Plasmon Resonance sensor, the cartridge comprising an optical element having a first surface and a mounting member for supporting a sensing agent located on a second surface of the optical element, the first surface comprising a first means for directing a beam of light incident on the optical element towards the second surface at an angle of incidence to the second surface that results in substantially total internal reflection of the beam of light at an interface of the mounting member and the second surface wherein the cartridge further comprises a detachable channel suitable for containing a fluid sample to be tested.

2) A cartridge as claimed in Claim 1 wherein the channel locates on the second surface of the cartridge such that the fluid sample contained within the channel makes physical contact with the sensing agent.

3) A cartridge as claimed in Claim 1 or Claim 2 wherein the optical element further comprises a third surface for the exit of beam of light from the optical element wherein the third surface includes a second means for directing the beam of light.

4) A cartridge as claimed in any of the preceding Claims wherein the optical element comprises a material having a first dielectric constant while the mounting member comprises a material having a second dielectric constant wherein the second dielectric constant is of an opposite sign to that of the first dielectric constant.

5) A cartridge as claimed in any of the preceding Claims wherein the first means for directing the light beam comprises a focusing element for focusing the beam of light to a line at the interface of the mounting member and the second surface.

6) A cartridge as claimed in any of Claims 3 to 5 wherein the second means for directing the light beam comprises a defocusing element.

7) A cartridge as claimed in any of the preceding Claims wherein the mounting member comprises a metal.

8) A cartridge as claimed in any of the preceding Claims wherein the optical element comprises an injection moulded plastic material.

9) A cartridge as claimed in any of the preceding Claims wherein the sensing agent comprises one or more antibodies each antibody being suitable for binding a pathogen.

10) A cartridge as claimed in Claim 9 wherein the bound pathogen is selected from the group comprising Legionella, Escherichia coli, Salmonella, Bacillus Anthracis, Yersinia Pestis, Lysteria, Cryptosporidium, Variola virus, Picomaviridae Apthovirus, Filoviruses, any plasticiser, steroid, medicinal drug or illicit substance or any other known fluid borne bacterium.

11) A cartridge as claimed in Claim 9 or Claim 10 wherein a protein substrate and a ligand is employed to bind a biotinylated antibody to the metal.

12) A cartridge as claimed in Claim 11 wherein the protein substrate comprises biotin.

13) A cartridge as claimed in Claim 11 or Claim 12 wherein the ligand comprises a protein selected from the group comprising avidin, strepavidin and neutravidin.

14) A Surface Plasmon Resonance sensor comprising a light source for generating a beam of light, a cartridge as claimed in any of Claims 1 to 13, and a light beam detection means wherein the employment of the cartridge allows for the miniaturisation of the sensor.

15) A Surface Plasmon Resonance sensor as claimed in Claim 14 wherein the light source comprises a diode laser.

16) A Surface Plasmon Resonance sensor as claimed in Claim 14 or Claim 15 wherein the light beam detection means comprises a detector and a data processing means.

17) A method of field detection of one or more pathogens that comprising the steps of:

1) Selecting an appropriate cartridge for the detection of one or more pathogens for use in a Surface Plasmon Resonance sensor;

2) Calibrating the Surface Plasmon Resonance sensor; and

3) Testing a fluid sample for the presence of one or more of the pathogens;

18) A method of field detection of one or more pathogens as claimed in Claim 17 wherein the selection of the appropriate cartridge comprises locating the cartridge with one or more appropriate antibodies for binding with the one or more pathogens.

19) A method of field detection of one or more pathogens as claimed in Claim 17 or Claim 18 wherein calibration of the Surface Plasmon Resonance sensor comprises:

1) Irradiating a mounting member with a beam of light in the absence of the fluid sample; and

2) Detecting a component of the beam of light reflected from the mounting member and storing the data as a reference signal;

20) A method of field detection of one or more pathogens as claimed in Claim 17 to Claim 19 wherein the testing of a fluid sample for the presence of one or more pathogens comprises:

1) Locating the fluid sample with respect to a channel;

2) Connecting the channel to the cartridge;

3) Irradiating the fluid sample with the beam of light;

4) Detecting the beam of light reflected from the mounting member and storing the data as a sample signal; and

5) Comparing the sample signal with the reference signal.